Amendments to Claims

Claim 1-12 (Canceled).

Claim 13 (Original) . A method for the optimization of the production of a genetic end product comprising:

a) providing a multiplicity of integration cassettes, each cassette comprising:
   (i) a promoter;
   (ii) a selectable marker bounded by specific recombinase sites responsive to a recombinase;
   (iii) regions of homology to different portions of a P1 donor cell chromosome;

b) transforming at least one donor cell with the integration cassette of (a) for its chromosomal integration;

c) infecting the transformed donor cell of (b) with a P1 phage wherein the phage replicates and the donor cell is lysed;

d) isolating phage released by the lysis of the donor cell of (c);

e) mixing equal number of isolating phage released by the lysis of a set of donor cells of (c) carrying different integration cassettes of (a);

f) infecting a recipient cell with the mixture of the isolated phage of (e) wherein the integration cassettes each integrate into the recipient cell chromosome at the point of homology to the homology arms;

g) selecting transduced recipient cells on the basis of the selectable marker;

h) screening the recipient cell of (f) for the highest level of the genetic end product to identify a first overproducing strain;

i) activating a recombinase in the first over producing strain of (h) which excises the selectable marker from the chromosomally integrated integration cassette;

j) infecting the first over producing strain of (i) with the mixture of the isolated phage of (e) wherein the integration cassettes each integrate into the recipient cell chromosome at the point of homology on the homology arms;

k) screening the first over producing strain of (j) for the highest level of the genetic end product to identify a second overproducing strain; and

i) comparing the levels of genetic end product produced by the first and second over producing strains whereby the production of the genetic end product is optimized.

Claim 14 (Original) A method according to Claim 13 wherein the promoter regions are derived from a cell other than the donor cell or recipient cell.

Claim 15 (Original) A method according to Claim 13 wherein the promoter is selected from the group consisting of *lac*, *ara*, *tet*, *trp*, λP_L, λP_R, *T7*, *tac*, P_{T5}, and *trc*.

Claim 16 (Original) A method according to Claim 13 wherein the promoter is P_{T5}.

Claim 17 (Original) A method according to Claim 13 wherein the donor cell and recipient cell have the genes that comprise the isoprenoid biosynthetic pathway.

Claim 18 (Original) A method according to Claim 17 wherein the integration cassette integrates into the recipient chromosome so as to operably link the promoter and a gene of the isoprenoid biosynthetic pathway.

Claim 19 (Original) A method according to Claim 18 wherein the genes of the isoprenoid biosynthetic pathway are selected from the group consisting of *dxs*, *dxr*, *ygbP*, *ychB*, *ygbB*, *idi*, *ispA*, *lytB*, *gcpE*, *ispA*, *ispB*, *crtE*, *crtY*, *crtI*, *crtB*, *crtX*, *crtW*, *crtO*, *crtR*, and *crtZ*.

Claim 20 (Original) A method according to Claim 18 wherein the genetic end product is a carotenoid selected from the group consisting of antheraxanthin, adonixanthin, astaxanthin, canthaxanthin, capsorubrin, β-cryptoxanthin, didehydrolycopene, didehydrolycopene, β-carotene, ζ–carotene, δ–carotene, γ–carotene, keto–γ–carotene, ψ–carotene, ε–carotene, β,ψ–carotene, torulene, echinenone, gamma carotene, zeta-carotene, alpha-cryptoxanthin, diatoxanthin, 7,8-didehydroastaxanthin, fucoxanthin, fucoxanthinol, isorenieratene, β-isorenieratene lactucaxanthin, lutein, lycopene, neoxanthin, neurosporene, hydroxyneurosporene, peridinin, phytoene, rhodopin, rhodopin glucoside, siphonaxanthin, spheroidene, spheroidenone, spirilloxanthin, uriolide, uriolide acetate, violaxanthin, zeaxanthin-β-diglucoside, zeaxanthin, and C30-carotenoids.